Space Weather Forecast

Issued on Monday, 11 December 2023 at 12:55 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Chance of further isolated Moderate flares, mainly Days 1-2 (11-12 Dec).

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been Moderate, with an isolated peak Moderate flare at 10/2243 UTC from a region close to the southwest limb, which remains the most active region. In total there are currently eight sunspot regions on the disc, including one small and newly emerged region close to centre disc in the northern hemisphere. One small region in the southwest has faded from view in the past 24 hours. The largest region on the disc is currently close to north centre disc. This region continues to evolve slowly and has developed two small delta spots in its central portion, showing increased magnetic complexity. A small region to the south of this has redeveloped into a bipolar region in recent hours. The remaining regions are currently relatively small and simple at the present time, and have exhibited either minimal change or decay.

No Earth-directed Coronal Mass Ejections (CMEs) were observed in available imagery. However, a filament disruption in the northwest disc was observed on SDO/AIA-0304 around 11/0800 UTC and a dimming event was observed 11/0900-1100 UTC close to centre disc, both of which may have produced a CME which is not yet discernible on LASCO imagery.

Solar Wind / Geomagnetic Activity: Solar winds as observed by ACE and DSCOVR at L1 were at slow-ambient levels. Wind speeds as measured by ACE were around 350km/s, but have gradually declined to 310-320 km/s. The Total Interplanetary Magnetic Field (Bt) was weakly fluctuating, while the important north-south component (Bz) also varied weakly. Geomagnetic activity was Quiet (Kp 0-1).

Energetic Particles / Solar Radiation: The count rate of energetic particles remained at background levels with no solar radiation storms observed.

Four-Day Space Weather Forecast Summary

Solar Activity: Low activity is expected, with a decreasing likelihood of further isolated Moderate-class flares, predominantly from the two more complex regions on the disc - one close to the southwest limb and the other in the north-centre disc. The region in the southwest is expected to rotate across the western limb during Days 1-2 (11-12 Dec). Further regions are expected to rotate onto the disc through the period, but there is no strong signal for any significant returning regions.

Solar Wind / Geomagnetic Activity: There are no Earth-directed Coronal Mass Ejections (CMEs) currently expected in the forecast period. An enhancement to slightly elevated speeds from one of two coronal holes is possible during Day 1 (11 Dec), although these are difficult to observe so confidence remains low. Wind speeds are then expected to decline to slow-ambient levels through Days 2-3 (12-13 Dec). A further coronal hole, which is a new feature for this rotation, is expected to enhance wind speeds again sometime on Day 4 (14 Dec) to slightly elevated, or possibly elevated levels. Late Day 4 there is a very slight chance of an isolated G1/Minor Geomagnetic Storm interval (Kp 5), but this is considered a very low probability at this

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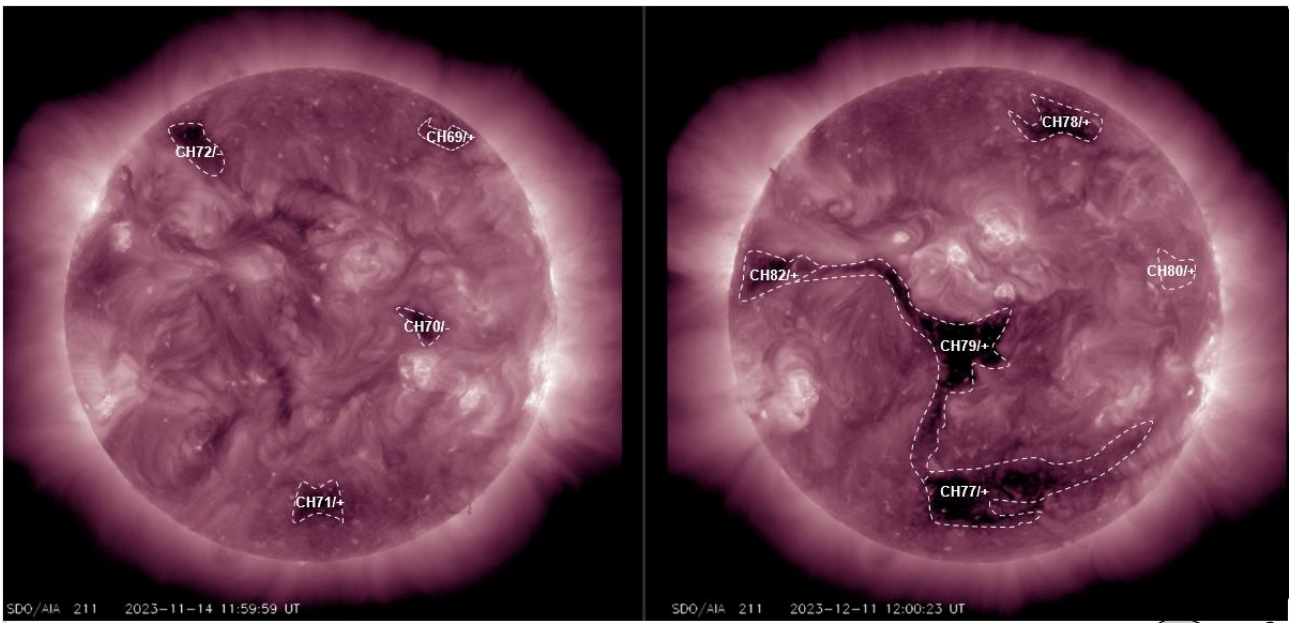
stage.

Current Quiet (Kp 0-2) geomagnetic activity may increase with the onset of any fast streams from coronal holes to become Unsettled (Kp 3) with a slight chance of an Active interval (Kp 4) on Day 1. Activity is expected to then be largely Quiet, but with a similar increase in geomagnetic activity possible again on Day 4 with the onset of a further stream of coronal hole fast winds.

Energetic Particles / Solar Radiation: The count rate of energetic particles is forecast to remain at background levels with only a very slight chance of rising towards the S1/Minor Radiation Storm threshold should any significant flares occur from the two largest regions on the visible disc. This risk decreases as one of the significant regions rotates off of the visible disc during Days 1-2 (11-12 Dec).

Figure 1. SDO/AIA-211 Imagery comparing the position and shape of coronal holes on last rotation on the left (14 Nov) and today on the right (11 Dec)



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Met Office Space Weather Forecast

Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	1	1	1	5
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	50	40	30	30
Very Active	R3 to R5 X	No	5	5	5	5

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	10	10	5	5
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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